Hydrogen Quick Facts

Energy Content and Use

- Hydrogen has the highest energy content per unit of weight—52,000 British Thermal Units (Btu) per pound —of any known fuel. This means that on a "weight" basis, hydrogen has nearly three times the energy content of gasoline. On a "volume" basis, however, hydrogen takes up significantly more volume than gasoline.
- Hydrogen is primarily used as a feedstock, intermediate chemical, or specialty chemical.
- NASA is the primary user of hydrogen as an energy carrier to power equipment.

Production

- The U.S. hydrogen industry currently produces 9 million tons of hydrogen per year for use in chemicals production, petroleum refining, metals treating, and electrical applications. When used as an energy carrier, 9 million tons of hydrogen could power 20-30 million cars or 5-8 million homes.
- Steam methane reforming, a process that converts hydrocarbon fuels such as natural gas into hydrogen and carbon monoxide, accounts for 95% of the hydrogen produced in the United States.
- Other hydrogen production methods include the following:
  - Electrolysis, which uses an electrical current to split water into hydrogen and oxygen; the electricity can be generated from renewable sources
  - Gasification, which uses heat to break down biomass or coal into a gas from which hydrogen can be generated
  - Photobiological techniques, which use algae to produce hydrogen in the presence of sunlight
  - Photoelectrochemical processes, which split water into hydrogen and oxygen using only sunlight
  - Thermochemical processes, which involve using nuclear or solar heat to split water into hydrogen and oxygen

Storage and Delivery

- Hydrogen can be stored as a compressed gas or liquid, or in a chemical compound.
- Hydrogen can be transported by pipeline or over the road in cylinders, tube trailers, and cryogenic tankers; a small amount can be shipped by rail or barge.
- Pipelines, which are owned by merchant hydrogen producers, are limited to a few areas in the United States where large hydrogen refineries and chemical plants are concentrated, such as Indiana, California, Texas, and Louisiana.
- Hydrogen distribution via high-pressure cylinders and tube trailers has a range of 100-200 miles from the production facility. For longer distances of up to 1,000 miles, hydrogen is usually transported as a liquid in super-insulated, cryogenic, over-the-road tankers, railcars, or barges, and then vaporized for use at the customer site.

Safety

- Hydrogen did not cause the *Hindenburg* to blow up.
  A study of the accident implicates the paint used on the skin of the airship, which contained the same component as rocket fuel. According to the study, as the *Hindenburg* docked in 1937, an electrical discharge ignited its skin, and a fire raced over the surface of the airship. Of the 37 people who died, 35 perished from jumping or falling to the ground. Only two of the victims died of burns, and these were caused by the burning coating and on-board diesel. The hydrogen burned quickly, upward and away from the people.

For more information, please visit http://www.eere.energy.gov/hydrogenandfuelcells.